

Application No.: 10/694,116
Amendment Dated: January 8, 2007
Reply to Office Action of: October 10, 2007

MAT-8478US

Remarks/Arguments:

Claims 11, 12, and 18 have been amended. Claims 20-22 have been added. No new matter is introduced herein. Claims 1-10, 13-17, and 19 have been cancelled. Claims 11, 12, 18 and 20-22 are pending.

Claim 11 has been amended to clarify that a change in an external force acting upon an object grasped with a grasp force is determined. Claim 11 has also been amended to clarify the features of determining whether a change in the external force is due to a delivery of the grasped object, i.e., a request to release the object (first condition) or a non-delivery of the grasped object (second condition) in order to release the grasped object or strengthen the grasp force, respectively. Claims 12 and 18 have been amended to correspond to amended claim 11. Basis for the amendments can be found, for example, at page 5, line 11-page 11, line 10, page 13, line 24-page 15, line 14; and Figs. 1 and 6.

Claims 1, 2, 4, and 9 have been rejected under 35 U.S.C. §112, second paragraph, as being indefinite because these claims include grammatical and idiomatic errors. Claims 1, 2, and 4 have been cancelled. Applicants note that paragraph 2 recites that claim 9 is rejected. However, because paragraph 6 recites that claim 12 is indefinite and unclear, Applicants believe that claim 9 was inadvertently included in the rejection under 35 U.S.C. §112, second paragraph. Accordingly, Applicants have responded to the rejection under 35 U.S.C. §112, second paragraph, with respect to claim 12. Claim 12 has been amended to clarify the language. Accordingly, Applicants respectfully request that the rejection be withdrawn.

Claims 1 and 11 have been rejected under 35 U.S.C. §102(b) as being anticipated by Graham (U.S. Pat. No. 5,200,679). Claims 2, 4, and 12 have been

rejected under 35 U.S.C. §103(a) as being unpatentable over Graham in view of Andeen et al. (U.S. Pat. No. 4,637,736) or Hill et al. (U.S. Pat. No. 3,904,234). Claims 9 and 18 have been rejected under 35 U.S.C. §103(a) as being unpatentable over Graham in view of Chao et al. (U.S. Pat. No. 5,847,529) or Hollbrooks (U.S. Pat. No. 6,692,049). Claims 1, 2, 4, and 9 have been cancelled. It is respectfully submitted, however, that the remaining claims are now patentable over the cited art for the reasons set forth below.

Claim 11, as amended, includes features neither disclosed nor suggested by the cited art, namely:

- a) determining a change in an external force acting upon an object grasped with a grasp force;
- b) determining, when the change in the external force is equal to or greater than a predetermined threshold, if the change in the external force is due to a first condition which is a delivery of the grasped object or a second condition which is a non-delivery of the grasped object; and
- c) outputting a grasp-force relaxing signal for releasing the grasped object when the change in the external force is due to the first condition and a grasp-force strengthening signal for strengthening the grasp force on the grasped object when the change in the external force is due to the second condition. (Emphasis Added)

Graham discloses, in Figs. 1-3, an artificial hand 11 including a sensing pad 72 provided on finger 14. As shown in Figs. 5 and 6, a cylinder 71 is grasped between sensing pad 72 and phalanx 17. Graham discloses that a greater tensile force is applied until a compressive force detected by sensing pad 72 reaches a predetermined level so that an object is grasped by hand 11 (Col. 7, lines 40-65). Graham does not disclose or suggest Applicants' claimed features of "determining a change in an external force acting upon an object grasped with a grasp force"

(emphasis added). These features are neither disclosed nor suggested by Graham. Instead, Graham determines the grasp force (compressive force) for grasping an object. Graham is silent on detecting an external force acting on an object that is grasped with a grasp force. Thus, Graham cannot disclose or suggest determining whether a change in the external force is due to a delivery of the grasped object (first condition) or a non-delivery of the grasped object (second condition) in order to release the grasped object or strengthen the grasp force, respectively, as recited in claim 11. Therefore, Graham does not include all of the features of claim 11.

The remaining cited art do not make up for the deficiencies of Graham because these references, either alone or in combination, do not disclose or suggest determining an external force acting on an object that is grasped with a grasp force and determining whether to release the object or strengthen a grasp force on the object based on the determined external force. The subject invention provides an advantage not found in the cited references of being capable of controlling the grasp force on an object as if a person delivers the object to another person. In an exemplary embodiment, a force acting on a robot hand is detected with a force sensor 103 (Fig. 1) such that the external force acting on a grasped object is detected. In an exemplary embodiment, the subject invention determines whether the detected external force corresponds to delivering the object to another person or whether it is based on external forces such as gravity. In this manner, it can be determined whether to release the object or to strengthen the grasp force on the object. These features and advantages are neither disclosed nor suggested by the cited art. Accordingly, allowance of claim 11 is respectfully requested.

Claims 12 and 18 include all of the features of claim 11 from which they depend. Accordingly, claims 12 and 18 are also patentable over the cited art.

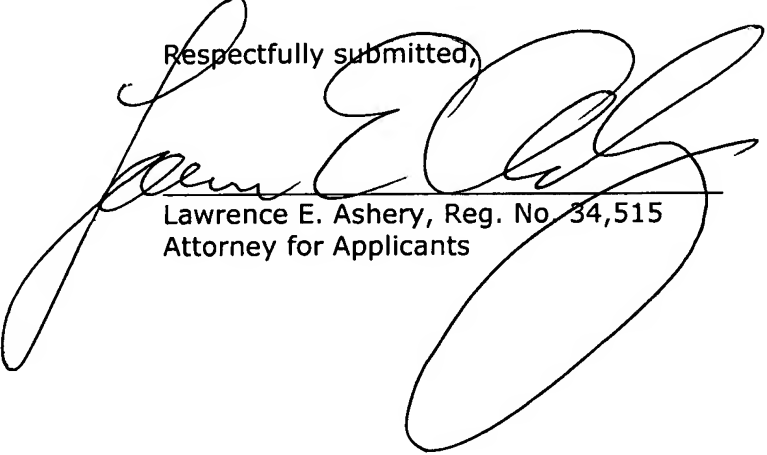
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Claims 20-22 have been added. No new matter is introduced herein. Claims 20-22 correspond to amended claims 11, 12, and 18, respectively. Support for new claims 20-22 can be found, for example, at page 5, line 11-page 11, line 10, page 13, line 24-page 15, line 14; and Figs. 1 and 6. Claims 20-22 are also patentable over the cited art for at least the same reasons as set forth above for claim 11.

In view of the amendments and remarks set forth above, the above-identified application is in condition for allowance, which action is respectfully requested.

Respectfully submitted,


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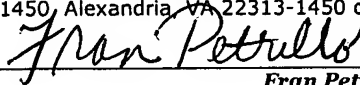
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